CONSUMER CONFIDENCE AND YIELD SPREADS IN EUROPE

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ABSTRACT

This paper shows the extraordinary capacity of yield spreads to anticipate consumption growth as proxy by the Economic Sentiment Indicator elaborated by the European Commission in order to predict turning points in business cycles. This new evidence complements the well known results regarding the usefulness of the slope of the term structure of interest rates to predict real economic conditions and, in particular, recessions by using a direct measure of expectations. A linear combination of European yield spreads explains a surprising 93.7% of the variability of the Economic Sentiment Indicator. Yield spreads seem to be a key determinant of consumer confidence in Europe.

1. Introduction

The issue of predicting real economic activity is of course a tremendously important task. This paper particularly focuses upon the predictive ability of the slope of the term structure of interest rates. This exercise seems to be justified given the previous empirical evidence in which the behaviour of the slope of the term structure of interest rates has been found to be an even better predictor of future economic activity than stock returns and other leading economic and financial indicators. In general, inverted zero-coupon curves tend to anticipate recessions, while upward-sloping curves tend to forecast expansions. In fact, the slope of the yield curve not only anticipates economic activity but is also an empirically significant predictor of inflation.

The papers by Harvey (1988), Chen (1991), Estrella and Hardouvelis (1991) are earlier examples in which a positive relationship between the spread of long-term and short-term interest rates and future economic activity is found. More recently, Estrella and Mishkin (1997) also find a positive relationship not only for US data, but also for Germany, France, the UK and Italy. At the same time, when anticipating recessions in the US market, Estrella and Mishkin (1998) document that the yield spread performs even better than composite index indicators. A similar finding for Europe is reported by Moneta (2003). Finally, Estrella, Rodrigues and Schich (2003) show that the positive relationship between spreads and future real activity is stable across a number of alternative time periods.

In principle, there are two reasons why yield spreads seem to predict output growth. The first is related to the effects of monetary policy: the yield curve tends to flatten in periods when there is a tightening monetary policy. If the central bank tightens monetary policy, short rates will temporarily increase, and market participants will expect future short rates to be lower than the current rate. Then, according to the expectation hypothesis, long-term interest rates will increase less than the short rate. Hence, short-term interest rates rise relatively more than long-term rates leading to a monetary contraction that may contribute to an economic slowdown and lower inflation. Estrella and Mishkin (1997) point out that the extent of the flattening of the yield curve as a consequence of a rise in the central bank rate is related to the credibility associated with the central bank strategy. Hence, they argue that although the central bank may influence the term structure that does not mean that it can control it in any relevant sense. In a closely related paper, Estrella (2004) argues that the extent to which the yield curve predicts economic activity depends on the form of the monetary policy reaction function, and therefore even though we may observe a significant positive relationship, it is not structural. If monetary policy reacts mainly to output fluctuations and is based on changes in interest rates (and not on levels), then the yield curve should be a good predictor. Under other conditions, however, the anticipating ability of yield spread may become insignificant.

The second reason is given by Harvey (1988) and it is based on the maximization of the intertemporal consumer choice under the Consumption Capital Asset Pricing Model (CCAPM), in which a formal relationship between real yields spreads and expected consumption growth is obtained. Under this model, a negative covariance between real yield spreads and marginal utility of aggregate consumption implies a positive risk premium for long-term over short-term bonds. The basic idea is that real yield spreads contain information on investors' expectations regarding future economic growth when deciding their optimal plan of consumption and saving. The representative consumer prefers a stable level of income (and consumption) rather than high rents during economic expansions and low income in recessions. Otherwise, income (and consumption) volatility increases and the risk averse investor rejects higher uncertainty. In the version of the model in which there is a risk-free zero coupon bond, if the investor expects a lower income (economic slowdown), he would prefer to save and buy long-term bonds to obtain higher payoffs precisely in those states. This would increase the demand for long-term bonds, augmenting their prices and reducing the corresponding long rate. To finance this investment activity, he would sell short-term bonds, increasing their yields. In the end, when a recession is expected, the yield curve would tend to flatten. The main problem in interpreting this type of model is that the theoretical relationship is valid for the real term structure, and the available empirical results on predictability are obtained under the nominal term structure. Hence, for all arguments to be consistent, inflation expectations should not play a relevance role in economic activity. Recently, Wachter (2004) extends this model to incorporate a time-varying price of risk generated by external habit and expected inflation. The model is able to account for the short and long-run fluctuations in the short-term interest rate and the yield spread.

The objective of this paper is to study the relationship between spreads and business cycles using a direct measure of expectations of future consumption growth. Hence, we use data of a different type from those previously employed in literature. In previous research authors have used *ex post* data on consumption or output growth as proxies for their expected values. In this paper, however, we employ a direct measure of economic agent expectations about future economic growth. In particular, we use the Economic Sentiment Indicator (henceforth ESIN), drawn up by the European Commission. This index directly stands for the expectations of economic agents about the future economic situation over the next twelve months. ESIN is elaborated from the balances (in percentage points) of the answers to questions about production expectations, future consumption expenses, present and future business conditions, unemployment expectations, future trends in real estate property values, and so on. It should be pointed out that the surveys do not include questions directly related to financial variables such as stock prices or stock indexes, interest rates, currency exchange rates and others. To the best of our knowledge, this is the first paper that tests the anticipating ability of yield spreads on future activity by directly measuring agent expectations. In this sense, this paper may be understood as a way of analyzing the determinants of ESIN and, therefore, our research discusses what causes movements in consumer confidence itself. Ludvigson (2004) studies if consumer confidence in the US forecasts consumption[1]. However, there is very little evidence on the determinants of these sentiment indices. To the best of our knowledge, Fuhrer (1993) is the only available evidence in this regard. He studies the overall contribution of US national income, unemployment rate, inflation and real interest rates on the US consumer sentiments. This paper contributes to literature in partially covering this gap.

Another difference between this paper and earlier research is the joint use of yield spreads from several countries to explain agent expectations for the European Union. Taking into account that European economies have experienced a strong convergence process during the last decade, we may assume that European agents share a common set of information and expectations about the future behaviour of the European economy. At the same time, the use of data from different countries helps to diversify

[1] Both, the University of Michigan´s Consumer Sentiment Index and the Conference Board´s Consumer Confidence Index are employed in her research.

away the idiosyncratic noise contained in the interest rates of each individual country and, therefore, a stronger explanatory power should be expected.

Our main results show that yield spreads in Europe contain extremely useful information that can be employed to forecast future economic growth as directly measured by investor expectations taken from ESIN. A linear combination of European yield spreads for bonds with one year and one month to maturity explain a striking 93.7% of the variability of ESIN. Moreover, out-of-sample tests suggest that our findings are also robust to alternative specifications on the forecasting ability of yield spreads.

The remainder of this paper is organized as follows. Section 2 contains the discussion on the empirical specification. The data, as well as a brief description of ESIN, are detailed in Section 3. Section 4 analyzes the relationship between ESIN and yield spreads, while Section 5 contains the evidence about the out-of-sample forecasting ability of yield spreads. Finally, Section 6 summarises the main conclusions.

2. The Empirical Specification

Although theoretical models are given in terms of real interest rates, previous literature suggests the following linear specification of the model with nominal yield spreads mainly because the real spreads are not observable[2]:

$$E_t\left[\Delta c_{t+h,t+j}\right] = \alpha_0 + \beta_0 nsp_{t-k}^{(h,j)} + u_t \qquad [1]$$

where $\Delta c_{t+h,t+j}$ is the continuously consumption growth rate between $t+h$ and $t+j$, $nsp_{t-k}^{(h,j)}$ is the nominal spread at any time $t - k$ between zero-coupon bonds maturing at $t+j$ and $t+h$.

In our empirical specification, expression [1] is slightly modified to incorporate wider information set to approximate the conditional expected consumption growth. To justify

[2] See Estrella (2004) for a macroeconomic justification of the use of nominal yield spreads in this context. Nominal yield spreads are a good indicator of business cycles due to their forecasting ability in predicting future expected real interest rates.

our approach, we assume that the process driving nominal yield spreads and expected consumption growth belong to a class of non-stationary processes known as locally stationary processes[3]. These processes can be divided into two sums, a smooth function of time that represents the unconditional mean plus a stationary process scaled by a time-varying covariance matrix. These characteristics make these processes consistent with economic variables that present a smooth and time-varying mean reversion such as interest rates and ESIN. It is in this sense that these processes are very useful for the type of data we employ in our empirical application[4]. Moreover, it turns out that this assumption is sufficient to guarantee that the usual regression framework employed in the following sections is well specified. Finally, it should also be pointed out that this assumption basically says that the variables employed may be non-stationary in mean and variance, but they are stationary in higher order moments.

Therefore, under this assumption, our variables can be written as a time-varying smooth function which is the expected value at *t*, plus a heteroskedastic error. Hence, in order to relate this expected value to nominal spreads, we use an average of yield spreads during the last *p* periods to estimate the time-varying expectation. Our empirical specification is therefore based on the following expression:

$$E_t\left[\Delta c_{t+h,t+j}\right] = \alpha_1 + \beta_1 \frac{1}{1+p}\sum_{k=0}^{p} nsp_{t-k}^{(h,j)} + u_t \qquad [2]$$

Again, our implicit argument is that nominal yield spreads have predictive power with respect to future expected consumption because they also have such power for expected real interest rates. Thus, nominal spreads should anticipate real economic activity as found in previous literature.

[3] See Dahlhaus (1997, 2000) for details.

[4] For processes with non-stationary distributions, it is not clear how we can statistically distinguish between unit-root processes and those which are characterized by a changing mean-reverting behaviour. However, economically speaking it seems more reasonable to think of processes with a time-varying mean reversion behaviour which justifies our assumption on locally stationary processes.

3. Data and Principal Component Analysis

3.1 Data

In order to analyze the relationship between nominal yield spreads and future real activity we employ a completely different data set from the one previously used in literature. We do not employ *ex-post* realizations of a measure of output or consumption, but rather focus on a direct measure of agent expectations. In particular, as already noted, we employ ESIN, which is a forward-looking confidence index elaborated by the European Commission[5]. This index is drawn up from a collection of qualitative questions about current and future behaviour of economic agents (according to the European Commission, approximately 67,000 firms and 24,000 consumers are surveyed each month across the European Union)[6]. It should be recalled that none of these questions is directly related to financial variables such as stock indices, interest rates, exchange rates, and so on. As the European Commission remarks, the "business and consumer surveys are qualitative economic surveys, intended for short-term economic analysis" in order to predict turning points in the economic cycle.

More precisely, ESIN is a composite indicator made up of four confidence indicators with different weights: an industrial confidence indicator (40% weight), a consumer confidence indicator (20%), a construction confidence indicator (20%) and a retail trade confidence indicator (20%). These indicators are calculated for each country of the European Union as the arithmetic average of the (seasonally adjusted) balances of the answers to specific questions chosen from the full set of questions in each survey included in the Programme of Business and Consumer surveys of the European Commission [7].

The aggregate ESIN for the European Union is obtained as a weighted average of the ESIN of each country, where the weights take into account the relative volume of each economy within the European Union. These weights are revised periodically according

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5 For more detailed information see "The Joint Harmonised EU Programme of Business and Consumer Surveys. User Guide 2002", European Commission, Directorate General of Economic and Financial Affairs, Brussels.

6 Although some questions concern the current situation of firms or households they are closely related with the future trends in the business cycle such as current order books or stocks of finished products. In particular, some questions are about the next twelve months, others about the next six months and others about the next three or four.

7 See "The Joint Harmonized EU Programme of Business and Consumer Surveys. User Guide 2002", European Commission, Directorate General of Economic and Financial Affairs, Brussels.

to the relative trends in each country. As far as the balance of the answers to the questions is concerned, there is a given range that lies between –100 and +100, and in this sense, ESIN is upper and lower bounded which is consistent with the assumption of a locally stationary structure. The monthly surveys are carried out in the first fortnight of each month and are published approximately two months afterwards. The European Commission makes data on the ESIN available to economic institutions around the world. ESIN can be understood as a good proxy of economic agents' expectations about future consumption especially in comparison with other variables usually employed in this sort of analysis. Previous papers assume rational expectations by using *ex-post* variables such as GDP or aggregate consumption as proxies for consumption growth expectations. The use of a direct measure of economic agent expectations should eliminate a good deal of the noise that other measures of expectations incorporate. A higher explanatory power of yield spreads when applied to a direct measure of agent expectations would be a very relevant outcome, and would provide strong support for understanding the anticipating capability of yield spreads.

An important issue which should be addressed before discussing the empirical results for the predicting ability of nominal yield spreads is to corroborate that ESIN does anticipate the European business cycle. We have a monthly time-series of the European Industrial Production Index (IPI) from January 1986 to December 2002. We also have the same time-period for ESIN. Using a simple regression framework, we test whether changes in the monthly ESIN index anticipate changes in IPI k months ahead where k is 1, 3, 6, 9 and 12 months. We therefore perform the following regression:

$$\Delta IPI_{t+k} = \alpha + \beta \Delta ESIN_t + \varepsilon_t \; ; \quad k = 1,3,6,9,12 \qquad [3]$$

Given that ESIN is a collection of questions covering the next twelve months we should expect changes in ESIN to anticipate more fully changes in industrial production from 6 to 12 months ahead. As reported in Table 1, this is indeed the case. ESIN does anticipate future economic activity as measured by industrial production, and this capability becomes clearer from 6 to 12 months ahead. The slope coefficient is always positive and significant, showing that positive revisions in expectations indicate future positive changes in industrial production.

The related evidence reported by Ludvigson (2004) for the US also suggests that survey measures contain information about the future path of macroeconomic data. Particularly, lagged values of both the Conference Board and Michigan overall index explain about 15% of the one-quarter-ahead variation in total personal consumption expenditure growth.

With respect to interest rates data, daily offer inter-bank interest rates from seven European countries (Germany, France, Italy, Spain, United Kingdom, the Netherlands and Sweden) are employed to calculate the interest rate corresponding to month *t* as the average of the rates of the last day of each week in month *t*[8]. The data used are then monthly simple averages of one-month and one-year interest rates from September 1993 to December 2002 to represent the short and long-term rates respectively. It is important to note that ESIN is drawn up with questions posted over the whole month and, in this sense, it seems reasonable to use an average interest rate over each month rather than the rate available at a given day during the month. It is also important to realize that ESIN reflects expectations over twelve months. This explains why we use the one-month and one-year rates as the short and long-term interest rates.

Non-reported summary statistics for both yield spreads and ESIN show that they have a great deal of persistence. Also, the analysis of yield spread correlations suggests the existence of two groups of countries, the Euro and non-Euro economies with average correlation coefficients of 0.67 and 0.80 respectively. The first group includes France, Germany, Italy, The Netherlands and Spain and the second Sweden and the United Kingdom. The mean yield spreads for the countries in the euro group is between 7 and 21 basis points and for those outside the euro is over 35 basis points. However, within the euro area we can also distinguish two subgroups: the first one comprises France, Germany and the Netherlands and the second Italy and Spain. The latter group is characterized by lower mean spreads, higher standard deviation and lower correlation coefficients than the other three Euro countries; additionally, the correlation coefficient between Italy and Spain is extremely high (0.90) as is the correlation coefficient between France, Germany and the Netherlands (0.88 on average). This result is not

[8] Interest rates data are provided by Datastream.

surprising at all, taking into account the convergence experience of the different countries that eventually adopted the new currency. In any case, as pointed out before, one of the advantages of using yield spreads from different countries is that it allows some of the idiosyncratic noise contained in the yield spread of each individual country to be diversified away.

3.2 Principal Component Analysis

Due to the high correlation between the spreads of different countries, we employ the eigenvectors from principal component analysis to analyze the predictive power of yield spreads of the European economies instead of using the spreads themselves[9]. Principal component analysis allows us to decompose the behaviour of the whole set of yield spreads into orthogonal components each of which corresponds to a different set of information. Moreover, we not only avoid the usual multicollinearity problems in the regression analysis shown below, but are also able to provide a more meaningful economic interpretation of the estimated coefficients since they can be associated with the principal components. The first component, which by definition is the (normalized) linear combination of yield spreads with maximum variance, explain more than 74% of the total variability of spreads, and the second practically 16% of the variance. As expected, the rest of the components are of only minor significance which brings us back again to the useful economic interpretation that may be made by analyzing principal components rather than using yield spreads directly.

Table 2 shows the weight of each country for each of the seven principal components. The first component can be understood as the time-varying average of the whole set of spreads and it therefore captures the common factor behind the behaviour of the interest rates of European economies. The second component highlights the differences between the three central euro economies considered in this study (France, Germany and the Netherlands) and all other countries (but particularly Italy and Spain). Finally, the third component reflects the differences between the non-euro countries (especially UK) and euro economies. This result was, in fact, anticipated at first glance on analyzing the correlation coefficients of yield spreads. The other components are difficult to identify,

[9] The empirical results in the next section of the paper will also be reported directly in terms of yield spreads.

although component five is clearly related to the behaviour of spreads in Sweden. These weights also help to explain the empirical evidence on the relationship between spreads and ESIN as reported in next section.

4. The Explanatory Power of Yield Spreads

4.1 Yield Spreads and Expected Consumption Growth

As discussed in Section 2 our empirical specification is based on expression [2], where the information set over which expectations are taken includes past data on yield spreads instead of using only contemporaneous data as previously imposed in literature. It should also be recalled that we assume processes with a smooth time-varying mean. Moreover, given our interest rate data, *h* corresponds to one month and *j* to one-year rates. As mentioned above, we employ the principal components of yield spreads of seven European countries, and we analyze whether the averages of these components over the past explain ESIN as observed today. In particular, we perform the following regression:

$$I_t = \beta_0 + \beta_1 ns_t^1 + \beta_2 ns_t^2 + ... + \beta_7 ns_t^7 + \varepsilon_t \qquad [4]$$

where ns_t^i is the average of the *i-th* principal component of yield spreads for our 7 European countries over the past twelve months (from *t* to *t-11*)[10]. It is crucial to note that we explain ESIN at time *t* with information available either at time *t* or before. The results are contained in Table 3, and they are striking. We are practically able to replicate ESIN by using averages of principal components of yield spreads over the previous year. The adjusted R^2 is 93.7%, and this suggests that the combined averages of principal components are an extremely powerful tool for predicting business cycles and future consumption growth. It must be emphasized that we employ known data at each point in time, and therefore we may conclude that (practically) the same information found in ESIN is thus available two months before the index is published. This is an interesting result not only because it confirms the predicting power of yield spreads as a leading economic indicator, but also because it shows that an *ex-ante* financial variable follows the same pattern as an index representing economic

[10] As suggested above, the use of all seven principal components simultaneously is motivated by the diversification effects of idiosyncratic noise in yield spreads.

expectations. To the best of our knowledge this is the first empirical evidence that support yield spreads for anticipating real economic activity as measured directly by agent expectations. Moreover, it suggests that yield spreads are a key determinant in explaining the variation of consumer confidence in Europe. Figure 1 contains the comparison between the realized and estimated ESIN using principal components. As expected, given the empirical results, the two are extremely closely related with a small mean squared error of 0.368.

The signs of beta coefficients in regression [4] reported in Table 3 are also interesting. It should be recalled that the first component is the time-varying average of yield spreads. In this sense the coefficient associated with the first component should be positive and significant to be consistent with previous empirical evidence on the relationship between spreads and future real activity. This is indeed the case. The coefficient is 0.72 and is highly significant[11]. It suggests that an increase in the slope of the term structure indicates positive revisions of expectations regarding future consumption growth. The second component basically reflects the difference between Italy/Spain and France/Germany. If the effect of central euro economies dominates, the associated coefficient in the previous regression should be negative to maintain the positive relationship between spreads and future economic activity. The same interpretation may be offered for the beta coefficient associated with the third component that captures the differential behavior of the United Kingdom. Therefore, the coefficients β_2 to β_7 represent corrections in the average positive relationship between spreads and agent expectations of future consumption growth. Thus, for example, increases in French and German yield spreads relative to other European economies are associated with further positive revisions of expectations regarding future economic activity in Europe. This analysis justifies the use of principal components over yield spreads, as long as we wish to have an interpretation over the mean relationship between spreads and economic activity.

To check the robustness of these results to other financial variables that are usually understood as leading indicators, we add the average monthly return of Eurostoxx50 during the past two years, $R_{t,24}$, to regression [4]. The results show that most of the

[11] t-statistics are based on robust Newey-West standard errors.

anticipating ability of financial variables is due to yield spreads. The adjusted R^2 increases marginally from 93.7 to 95.1, and the individual coefficients are practically the same although, as expected, the coefficient associated with Eurostoxx50 is positive and statistically significant.

In any case, for the sake of consistency with previous empirical evidence, Table 4 reports similar results in terms of yield spreads instead of principal components. The following three regressions are performed:

$$I_t = \beta_0 + \beta_1 nsp_{t,p}^{1} + \beta_2 nsp_{t,p}^{2} + ... + \beta_7 nsp_{t,p}^{7} + \varepsilon_t \qquad [5a]$$

$$I_t = \beta_0 + \beta_1 nsp_{t,p}^{avg} + \varepsilon_t \qquad [5b]$$

$$I_t = \beta_0 + \beta_1 nsp_{t}^{avg} + \varepsilon_t \qquad [5c]$$

where $nsp_{t,p}^{i}$ is the average of yield spreads over the last twelve months for country *i*; $nsp_{t,p}^{avg}$ is the mean yield spread over all countries of the average of yield spreads over the last twelve months, and nsp_{t}^{avg} is the contemporaneous mean yield spread over all countries. Although the regression is carried out for the European economy as a whole, it must be noted that expression [5c] is the closest exercise relative to the previous empirical evidence. The results confirm our reported evidence based on principal components. Once again, it is interesting to note that the relationship between yield spreads and expectations for future consumption growth improves when we use average data on yield spreads over the past twelve months instead of just the contemporaneous spread. Both the adjusted R^2 and the beta coefficient are higher in regression [5b] than in regression [5c]. It seems that the information contained in yield spreads that take into account the average behavior of spreads over the previous year is richer than that in the last spread available. Thus, there is a positive and significant relationship between yield spreads and agent expectations regarding future consumption growth as measured by ESIN. The evidence obtained relative to expectations instead of *ex-post* realizations of aggregate variables such as output or consumption growth is a key contribution of this paper[12].

5. The Out-of-Sample Forecasting Ability of Yield Spreads

As a final check, and in order to test the predictive ability of yield spreads and stock returns, we conduct an out-of-sample analysis. At each month *t* in the available period, we estimate the parameters in expression [4] using always the previous 24 observations. We now want to check whether yield spreads forecast ESIN for month *t* (in other words, we want to replicate ESIN for month *t* using past data from the available spreads). Then the coefficients estimated in the regression below using up to *t-2* (it is important to note that ESIN is available 2 months later than the current month) are multiplied for the spreads available at time *t* to reproduce ESIN at time *t*:

$$I_{t-2} = \beta_0 + \beta_1 ns^1_{t-2,p} + \beta_2 ns^2_{t-2,p} + ... + \beta_7 ns^7_{t-2,p} + \varepsilon_t \; ; \quad t = t,...,-23 \qquad [6]$$

and now, using $\hat{\beta}_0, \hat{\beta}_1,...,\hat{\beta}_7$ estimated by [6] up to month *t-2*, we calculate ESIN at month *t* as

$$\hat{I}_t = \hat{\beta}_0 + \hat{\beta}_1 ns^1_{t,p} + \hat{\beta}_2 ns^2_{t,p} + ... + \hat{\beta}_7 ns^7_{t,p} \qquad [7]$$

Finally, at each month, we compare the realized ESIN, I_t, with the estimated ESIN, $\hat{I}_t$. The results shown in Table 5 and Figure 2 provide very favourable evidence of the forecasting ability of nominal yield spreads for future agent expectations and future consumption growth. The Mean Absolute Error (MAE) using exclusively yield spreads is even lower than the forecast generated by the simultaneous use of information from spreads and stock market data.

[12] Similar results are also obtained when we divide the sample period into two sub-periods.

6. Conclusions

This paper shows the extraordinary capacity of yield spreads to forecast consumption growth. More precisely, using averages of past nominal yield spreads we are able to replicate the Economic Sentiment Indicator drawn up by the European Commission in order to predict turning points in the business cycles. This index stands directly for the expectations of economic agents about the future business situation over the next twelve months. In particular, we show how available nominal yield spreads explain a striking 93.7% of the variability of the Sentiment Indicator for the European Community. The fact that past average nominal yields seem to capture expectations of future consumption growth more fully than the last available spread may be related to the evidence reported by Parker (2003) in which households do not contemporaneously and completely adjust consumption to news about wealth in the period. The out-of-sample evidence confirms the relevance of yield spreads. We have found a very strong and important interaction between European consumer confidence and an economic variable representing the slope of the yield curve as given by the differential between one-month and one-year European interest rates.

REFERENCES

Chen, N. (1991), "Financial investment opportunities and the macroeconomy", *Journal Finance,* vol. 46, n. 2, pp. 529-554.

Dahlhaus, R. (1997): "Fitting time series models to nonstationary processes", *The Annals of Statistics*, vol. 25, pp. 1-37.

Dahlhaus, R. (2000): "A likelihood approximation for locally stationary processes", *The Annals of Statistics*, vol. 28, pp. 1762-1794.

Estrella, A. (2004), "Why does the yield curve predict output and inflation?", Working Paper, *Federal Reserve Bank of New York*.

Estrella, A. and G.A. Hardouvelis (1991), "The term structure as a predictor of real economic activity", *Journal of Finance*, vol. 46, n. 2, June, pp. 555-576.

Estrella, A. and F.S. Mishkin (1997), "The predictive power of the term structure of interest rates in Europe and the United States: Implications for the European Central Bank", *European Economic Review,* vol. 41, n. 7, pp. 1375-1401.

Estrella, A. and F.S. Mishkin (1998), "Predicting US recessions: financial variables as leading indicators", *Review of Economics and Statistics*, vol. 80, pp. 45-61.

Estrella, A., A. Rodrigues, and A. Schich (2003), "How stable is the predictive power of the yield curve? Evidence from Germany and the United States", *Review of Economics and Statistics*, vol. 85, pp. 629-644.

European Commission (2002): The Joint Harmonized EU Programme of Business and Consumer Surveys. User's Guide 2002. Directorate General of Economic and Financial Affairs, Brussels.

Fuhrer, J. (1993), "What role does consumer sentiment play in the US macroeconomy?", *New England Economic Review*, January/February, pp. 32-44.

Harvey, C.R. (1988), "The real term structure and consumption growth", *Journal of Financial Economics,* vol. 22, pp. 305-333.

Moneta, F. (2003), "Does the yield spread predict recessions in the Euro area?, Working Paper no. 294, *European Central Banks Working Paper Series*.

Ludvigson, S. (2004), "Consumer confidence and consumer spending", *Journal of Economic Perspectives*, vol. 18, pp. 29-50.

Parker, J. (2003), “Consumption risk and expected stock returns”, *American Economic Review*, vol. 93, pp. 376-382.

Wachter, J. (2004), “A consumption-based model of the term structure of interest rates”, Working Paper, The Wharton School, University of Pennsylvania.

Table 1

The Predictive Ability of the Economic Sentiment Indicator (ESIN) using the Industrial Production Index (IPI) as a Measure of Realized Real Activity
January 1986-December 2003

Monthly changes in ESIN are used to predict changes in real IPI over the next *k* months, for *k* = 1, 3, 6, 9 and 12 using OLS regressions of the form:

$$\Delta IPI_{t+k} = \alpha + \beta \Delta ESIN_t + \varepsilon_t$$

k (months ahead)	α	β	$\bar{R}^2$
1	0.0015 (2.34)[1]	0.3453 (1.99)	1.45
3	0.0047 (6.41)	1.4909 (7.71)	22.61
6	0.0095 (8.52)	2.4786 (8.53)	26.71
9	0.0145 (9.08)	3.1459 (7.64)	22.81
12	0.0197 (9.65)	3.6358 (6.94)	19.80

1/ t-statistics in parentheses

Table 2

Principal Components of Yield Spreads
Component Weights
September 1993-December 2002

	Component Number						
	1	2	3	4	5	6	7
France	0.3474	-0.4650	0.0051	-0.7727	0.0883	0.2316	0.0669
Germany	0.3935	-0.3775	-0.1507	0.2640	-0.1216	-0.2029	-0.7445
Italy	0.3306	0.5679	-0.3320	-0.3719	-0.0605	-0.5620	-0.0149
Netherlands	0.3926	-0.3655	-0.1003	0.3345	-0.2784	-0.2879	0.6557
Spain	0.3930	0.3385	-0.3519	0.1526	-0.2816	0.7102	0.0140
Sweden	0.4079	0.0997	0.0620	0.2442	0.8665	0.0469	0.0848
U.K.	0.3744	0.2462	0.8540	-0.0090	-0.2571	-0.0002	-0.0609

Table 3

Economic Sentiment Indicator (ESIN) and Yield Spreads
September 1993-December 2002

We report the coefficients and the adjusted R^2 from the following OLS regression

$$I_t = \beta_0 + \beta_1 ns_t^1 + \beta_2 ns_t^2 + ... + \beta_7 ns_t^7 + \varepsilon_t$$

where I_t denotes ESIN at month *t*, and ns_t^i is the average of the *i-th* principal component of yield spreads over the last twelve months (from *t to t – 11*)

	β_0	β_1	β_2	β_3	β_4	β_5	β_6	β_7	$\bar{R}^2$
Coefficient	100.20	0.72	-0.68	-0.71	-1.15	4.92	-9.77	-1.16	93.66
	(1097.3)[1]	(11.23)	(-6.95)	(-4.76)	(-3.77)	(10.40)	(-9.41)	(-0.88)	

1/ t-statistic in parentheses; all based on robust standard errors adjusted by Newey-West

Table 4

Economic Sentiment Indicator (ESIN) and Yield Spreads
September 1993-December 2002

We report the coefficients and the adjusted R^2 from three OLS regressions:

$$(1)\ I_t = \beta_0 + \beta_1 nsp^1_{t,p} + \beta_2 nsp^2_{t,p} + ... + \beta_7 nsp^7_{t,p} + \varepsilon_t$$

where I_t denotes ESIN at month *t*, and $nsp^i_{t,p}$ is the average of yield spreads over the last twelve months (*p* goes from *t to t – 11*) for country *i*;

$$(2)\ I_t = \beta_0 + \beta_1 nsp^{avg}_{t,p} + \varepsilon_t$$

where $nsp^{avg}_{t,p}$ is the mean yield spread over all countries of the average of yield spreads over the last twelve months (*p* goes from *t to t – 11*) for country *i*;

$$(3)\ I_t = \beta_0 + \beta_1 nsp^{avg}_t + \varepsilon_t$$

where nsp^{avg}_t is the contemporaneous mean yield spread over all countries

Regression (1) (past yield spreads of each country)

	β_0	β_1	β_2	β_3	β_4	β_5	β_6	β_7	$\bar{R}^2$
Coefficient	98.57	6.65	-0.95	8.10	-13.31	-3.05	2.42	6.19	93.66
	(625.94)[1]	(4.79)	(-1.55)	(15.42)	(-16.44)	(-10.12)	(1.84)	(14.19)	

Regression (2) (average over all countries of past yield spreads)

	β_0	β_1	$\bar{R}^2$
Coefficient	99.74	2.61	16.48
	(433.51)	(4.55)	

Regression (3) (average over all countries of contemporaneous spreads)

	β_0	β_1	$\bar{R}^2$
Coefficient	99.96	1.72	12.71
	(466.48)	(3.94)	

1/ t-statistic in parentheses; all based on robust standard errors adjusted by Newey-West

Table 5

The Predictive Ability of Yield Spreads and Stock Returns: Out-of-Sample Tests
September 1993-December 2002

The coefficients estimated in the regression below using data up to *t – 2* months, given that in practice ESIN is available two months later, are multiplied for the spreads available at time *t* to reproduce ESIN at time *t*:

$$I_{t-2} = \beta_0 + \beta_1 ns^1_{t-2,p} + \beta_2 ns^2_{t-2,p} + ... + \beta_7 ns^7_{t-2,p} + \varepsilon_t ;\ t = t,...,-23$$

then, using $\hat{\beta}_0, \hat{\beta}_1, ..., \hat{\beta}_7$ estimated up to month *t – 2*, we calculate ESIN at month *t*:

$$\hat{I}_t = \hat{\beta}_0 + \hat{\beta}_1 ns^1_{t,p} + \hat{\beta}_2 ns^2_{t,p} + ... + \hat{\beta}_7 ns^7_{t,p}$$

and, finally, we compare the realized ESIN at *t* with our estimated ESIN $\hat{I}_t$ calculating mean absolute errors. We repeat the exercise simultaneously using spreads and stock returns, and only lagged ESIN

	Number of Forecasts	Mean Absolute Error MAE	Maximum Absolute Error
Yield Spreads	77	0.502	1.813
Yield Spreads and Stocks	77	0.537	1.877
Lagged ESIN	75	0.917	2.430

Figure 1
Realized and Estimated ESIN using Yield Spreads
September 1993-December 2002

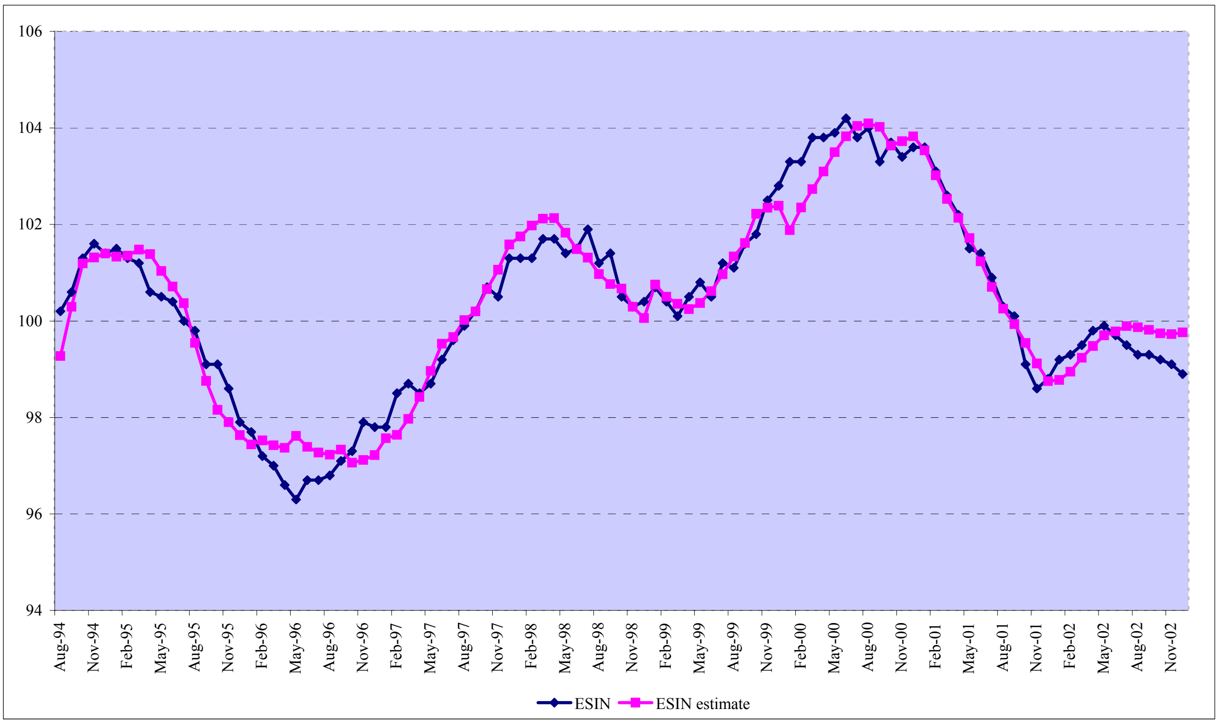
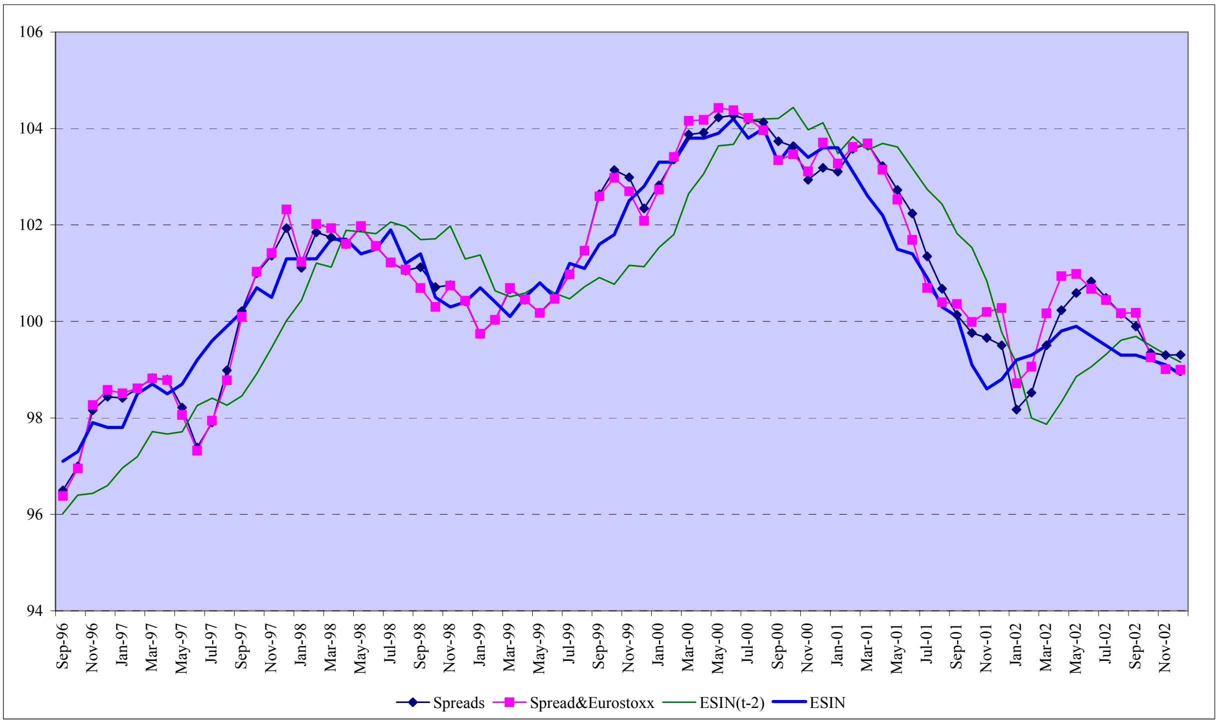


Figure 2
Predictive Ability of Yield Spread and Stock Returns
August 1996-December 2002



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Spreads
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